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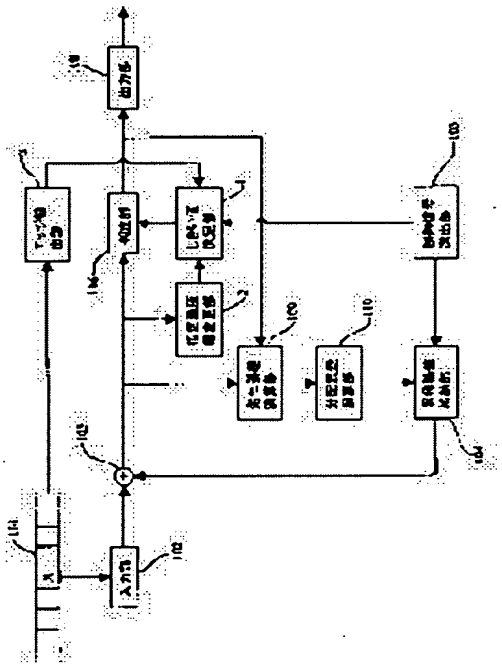
(54) IMAGE PROCESSOR

(57)Abstract:
PROBLEM TO BE SOLVED: To resolve the problem in conventional error diffusion processing where gradation reproducibility cannot be secured, due to connection of dots or the like at representing high and middle density areas a photographic image or the like.
SOLUTION: A threshold is periodically changed with a designated density width, which includes at least high and middle density areas in a prescribed range from a middle density, in accordance with the position on a document image of a notice pixel, and thus the essential definition of error diffusion processing is effectively used to secure high gradation reproducibility.



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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] It distributes to the circumference pixel which is around said attention pixel and has not yet made binary the generating error generated when making an attention pixel binary using a predetermined threshold. In the image processing system which performs error diffusion process which repeats the processing which changes the concentration of said circumference pixel about the pixel for values [each / two]-izing on a manuscript image, the Takanaka concentration field located in the predetermined range from middle concentration by the assignment concentration width of face included at least The image processing system characterized by making said threshold come to change periodically according to the location on said manuscript image of said attention pixel.
[Claim 2] The image processing system according to claim 1 which comes to change said assignment concentration width of face according to the concentration of said attention pixel.
[Claim 3] When there is concentration of said attention pixel within fixed limits from middle concentration When said assignment concentration width of face is not changed with a fixed value but the concentration of said attention pixel is in the other range The image processing system according to claim 2 which makes said assignment concentration width of face come to decrease so that it may become the assignment concentration width of face which is proportional to a concentration value in the low concentration section, and the assignment concentration width of face which was in inverse proportion to the concentration value in the high concentration section from said fixed value.
[Claim 4] An image processing system given in any 1 term of claims 1-3 to which said threshold is made to come to change only when said attention pixel cannot be found in the edge section.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to an image processing system, is distributed to the circumference pixel which is around said attention pixel and has not yet made binary the generating error generated in detail when making an attention pixel binary using a predetermined threshold, and relates to the image processing system which performs error diffusion process which repeats the processing which changes the concentration of said circumference pixel about the pixel for values[each / two]-izing on a manuscript image.
[0002]
[Description of the Prior Art] For example, in image processing systems, such as a digital process copying machine, and a printer, facsimile, in case multiple-value image data is changed into binary image data, it is common to perform false halftone processing which expresses in false the halftone which suited multiple-value image data on binary image data. Especially the multiple-value image data obtained from the photograph includes many halftone, and said false halftone processing is indispensable. Error diffusion process is in one of the false halftone processing of this. In said error diffusion process, a predetermined threshold The processing which distributes the generating error generated when using and changing the multiple-value concentration of an attention pixel into binary concentration to the circumference pixel which is around said attention pixel and is not yet made binary by repeating about the pixel for values[each / two]-izing on a manuscript image Crowding of the dot outputted according to the magnitude of multiple-value concentration is controlled, and halftone is expressed in false on an output image. For example, the case where it is made binary by said error diffusion process (binary error diffusion process) about the pixel which has the multiple-value concentration (white; 0 black;255) of 256 gradation is explained briefly. In said error diffusion process, the cumulative error which the generating error accumulated by being distributed, respectively is added to the multiple-value concentration of original [concentration / of the attention pixel measured with said threshold / multiple-value] of the pixel from other pixels. Supposing the threshold used in the case of binary-izing is a mean value (127) of said 256 gradation, that judgment whose binary concentration of an attention pixel is any of white (0) and black (1) will be performed in accordance with the criteria of the following (A) and (B).
(A) Attention pixel value + cumulative error > The binary concentration of an attention pixel is set as black (1) at the time of 127.
(B) The binary concentration of an attention pixel is set as white (0) at the time of attention pixel value + cumulative error <=127.
The generating error generated in the case of the judgment by the criteria of the above (A) and (B) is around an attention pixel, and it is distributed to the circumference pixel which is not yet then made binary. the generating error in case an attention pixel value satisfies said criteria (A) or (B) set black (1) of binary gradation, and white (0) to 255 of 256 gradation, and 0, respectively -- it becomes as [of (B1)] a degree type (A1), respectively.
(A1) Generating error = (cumulative error + attention pixel value) -255 (B1) Generating error = (cumulative error + attention pixel value) -0 top type (A1) and the generating error calculated by (B1) are distributed to a circumference pixel according to an error diffusion ratio as shown in drawing 7 . In the example of drawing 7 , one fourth of generating errors is distributed to the pixel on the right of direct and the pixel of right under with a near distance with an attention pixel, and one eighth of generating errors is distributed to 4 pixels of other circumference pixels, respectively. At this time, the generating error distributed to 6 pixels of said circumference pixels is only a part about said attention pixel, and generating errors, such as a pixel right above that pixel and a pixel on the left of [direct] said attention pixel, are already distributed to the pixel on the right of [direct] said attention pixel. Therefore, the cumulative error to which two or more pixels to the nearby generating error accumulated being compared with said threshold when the pixel on the right of [direct] said attention pixel turns into an attention pixel by being distributed, respectively, and the concentration data of the pixel original are added. Said error diffusion process is realizable with error diffusion-process equipment as shown in drawing 8 .
Concentration data are supplied to said error diffusion-process equipment from the Rhine memory 101. The amount of reflected lights of a manuscript is changed into an electrical signal by photo-electric-conversion means, such as CCD, said concentration data are digitized after that, concentration amendment etc. is performed further, and the concentration data for the horizontal-scanning line of one line of said photo-electric-conversion means are stored in said Rhine memory 101. In said error diffusion-process equipment, if the concentration data (multiple value) of the attention pixel X are supplied through the input section 102 among two or more pixels stored in the Rhine memory 101, according to the control signal sent out from the control signal sending-out section 103, the cumulative error corresponding to said attention pixel X will be extracted among the cumulative errors stored in the cumulative error storing section 104. By the adder 105, after the extracted this error is added to the concentration data of said attention pixel X, it is supplied to the judgment section 106. In this judgment section 106, the comparison with the threshold memorized by the value (concentration data of said attention pixel X after error diffusion) with which the cumulative error was added to the concentration data of said attention pixel X, and the threshold storage section 107 is performed according to said criteria (A) and (B). The result of the comparison according to said criteria (A) and (B) is supplied to the generating error operation part 109 while being outputted through the output section 108 from said judgment section 106. The concentration data of said attention pixel X after said error diffusion are also supplied to said generating error operation part 109, and the generating error over said attention pixel X calculates according to an upper type (A1) and (B1). The generating error calculated by said generating error operation part 109 is supplied to the distribution error operation part 110, it is around said attention pixel X, and a distribution error calculates it to each circumference pixel which is not yet made binary

according to the above error diffusion ratios. The distribution error calculated by said distribution error operation part 110 is added to the value of the address corresponding to the location of each circumference pixel of said cumulative error storing sections 104, and the cumulative error which the distribution error accumulated in said cumulative error storing section 104 is stored. If the concentration data of the attention pixel X supplied from the input section 102 by specifying this address according to said control signal are updated, the cumulative error corresponding to it will be extracted and it will be added to the concentration data of said updated attention pixel X.

[0003]

[Problem(s) to be Solved by the Invention] Although it can roughly divide into the line drawing image which made the alphabetic character and the line drawing the subject, and the photograph which made photograph drawing the subject, in case the image data set as the object of said binary-ized processing makes said line drawing image binary, and definition makes said photograph binary, it becomes respectively important [gradation nature]. Although the definition over a line drawing image is satisfying, it cannot be satisfied with different binary-ized processing from said error diffusion process, for example, simple binary-ized processing, of the gradation nature to a photograph. Moreover, in systematic dithering, although the gradation nature to a photograph and its repeatability are secured, the definition over a line drawing image will fall. On the other hand, said error diffusion process must be theoretically excellent about both definition and gradation nature. However, if said error diffusion process is actually performed, for example about human being's photograph, the part of black hair becomes deep-black, that it is hard to attach distinction of the hair of hair, it will become or contrast of the skin will be lost. This is the result of connecting the dot which crowded in order to express gradation nature in the Takanaka concentration field of said photograph with an actual output, and having spoiled the tone reproduction. For this reason, in the conventional image processing system, in order to realize both definition over said line drawing image, and gradation nature to said photograph, the mode in which systematic dithering other than the mode in which said error diffusion process performs binary-ized processing performed binary-ized processing needed to be formed, and the mode needed to be changed with said line drawing image and said photograph. In order that this invention may solve the technical problem in such a Prior art It distributes to the circumference pixel which is around said attention pixel and has not yet made binary the generating error generated when it was alike, an image processing system was improved and an attention pixel was made binary using a predetermined threshold. On the occasion of performing error diffusion process which repeats the processing which changes the concentration of said circumference pixel about the pixel for values[each / two]-izing on a manuscript image, the Takanaka concentration field located in the predetermined range from middle concentration by the assignment concentration width of face included at least It aims at offering the image processing system which can realize a high tone reproduction also to photograph drawing etc., securing definition by changing said threshold periodically according to the location on said manuscript image of said attention pixel. Moreover, when said threshold is changed like said image processing system, there are circumference **** to which the error diffused from a part for Kurobe affected the white part, and a possibility that the error diffused from the white part affected a part for Kurobe and of carrying out extraction injury generating. Then, other purposes are stopping circumference **** and said carrying out extraction injury generating by changing said assignment concentration width of face according to the concentration of said attention pixel. Furthermore, if said threshold is changed like said image processing system, in an edge, the irregularity according to change of said threshold may arise. Then, other purposes are suppressing said irregularity in an edge occurring by changing said threshold, only when said attention pixel cannot be found in the edge section.

[0004]

[Means for Solving the Problem] In order to attain said purpose, invention concerning claim 1 It distributes to the circumference pixel which is around said attention pixel and has not yet made binary the generating error generated when making an attention pixel binary using a predetermined threshold. In the image processing system which performs error diffusion process which repeats the processing which changes the concentration of said circumference pixel about the pixel for values[each / two]-izing on a manuscript image, the Takanaka concentration field located in the predetermined range from middle concentration by the assignment concentration width of face included at least According to the location on said manuscript image of said attention pixel, it is constituted as an image processing system characterized by making said threshold come to change periodically. Moreover, invention concerning claim 2 makes it the summary to come to change said assignment concentration width of face according to the concentration of said attention pixel in said image processing system according to claim 1. moreover, in said image processing system according to claim 2, when there is concentration of said attention pixel within fixed limits from middle concentration, invention concerning claim 3 When said assignment concentration width of face is not changed with a fixed value but the concentration of said attention pixel is in the other range Let it be the summary to make said assignment concentration width of face come to decrease rather than said fixed value so that it may become the assignment concentration width of face which is proportional to a concentration value in the low concentration section, and the assignment concentration width of face which was in inverse proportion to the concentration value in the high concentration section. Moreover, in an image processing system given in any 1 term of said claims 1-3, invention concerning claim 4 makes it the summary to make said threshold come to change, only when said attention pixel cannot be found in the edge section. In the image processing system of a publication, in any 1 term of said claims 1-4 It distributes to the circumference pixel which is around said attention pixel and has not yet made binary the generating error generated when making an attention pixel binary using a predetermined threshold. On the occasion of performing error diffusion process which repeats the processing which changes the concentration of said circumference pixel about the pixel for values[each / two]-izing on a manuscript image, the Takanaka concentration field located in the predetermined range from middle concentration by the assignment concentration width of face included at least Since said threshold is periodically changed according to the location on said manuscript image of said attention pixel, A high tone reproduction is securable also to photograph drawing etc., a dot stopping being connected easily and harnessing the definition of said error diffusion-process original, when the Takanaka concentration fields, such as photograph drawing, are outputted by the binary image. And in said image processing system according to claim 2 or 3, since said assignment concentration width of face is changed according to the concentration of said attention pixel, it can stop carrying out [to which the error which the error diffused from a part for Kurobe diffused from circumference **** which affected the white part, and a white part affected a part for Kurobe] extraction injury generating. Furthermore, in said image processing system according to claim 4, only when said attention pixel cannot be found in the edge section, said threshold changes, and when said attention pixel is in an edge, since it is fixed, said threshold can suppress that the irregularity according to change of said threshold occurs in an edge.

[0005]

[Embodiment of the Invention] Hereafter, with reference to an accompanying drawing, it explains per gestalt of operation of this invention, and an understanding of this invention is presented. In addition, the gestalt of the following operations is a concrete example of this invention, and is not the thing of the character which limits the technical range of this invention. The image processing system concerning this invention is distributed to the circumference pixel which is around said attention pixel and has not yet made binary the generating error generated when making an attention pixel binary using a predetermined threshold, and is materialized as a digital process copying machine equipped with the error diffusion-process equipment which repeats the processing which changes the concentration of said circumference pixel about the pixel for values[each / two]-izing on a manuscript image. As opposed to the concentration data of the attention pixel X inputted through the input section 102 from the Rhine memory 101 as said error diffusion-process equipment was shown in drawing 1 The cumulative error storing section 104 which stores the cumulative error extracted according to the control signal sent out from the control signal sending-out section 103, The concentration data of said attention pixel X, and the adder 105 adding said extracted cumulative error, The value (concentration data of said attention pixel X after modification by error diffusion process) outputted from said adder 105 is compared with a threshold. The output section 108 is minded from the judgment section 106 changed into either of the binary gradation, and said judgment section 106. The generating error operation part 109 which calculates the generating error over said attention pixel X based on the judgment result outputted and the concentration data of said attention pixel X after modification outputted from said adder 105, By said generating error operation part 109 The distribution error operation part 110 which calculates the distribution error distributed to the circumference pixel which is around said attention pixel X from the generating error over said calculated attention pixel X, and adds said distribution error to the value of the address corresponding to said circumference pixel of said cumulative error storing section 104 It is the same as that of error diffusion-process equipment conventional at the point of providing. That the error diffusion-process equipment concerning the gestalt of operation of this invention differs from conventional error diffusion-process equipment on the other hand By the assignment concentration width of face included at least, the Takanaka concentration field located in the predetermined range from middle concentration The threshold decision section 1 to which the threshold supplied to said judgment section 106 is periodically changed according to the location on the manuscript image of said attention pixel X specified from the control signal sent out from said control signal sending-out section 103, The assignment concentration width-of-face modification section 2 which changes said assignment concentration width of face of said threshold which said threshold decision section 1 changes according to the concentration data of said attention pixel X, It is the point of providing the edge extract section 3 for judging whether said attention pixel X being in an edge, and it is also this point that the digital process copying machine concerning the gestalt of operation of this invention differs from the conventional machine.

[0006] In conventional error diffusion-process equipment and the digital process copying machine equipped with this, the threshold which said threshold storage section 107 supplies to said judgment section 106 was being fixed to 127 (middle concentration) to the concentration data of for example, 256 gradation (white; 0 black;255). on the other hand , with the error diffusion process equipment concerning the gestalt of this operation , the threshold supply to said judgment section 106 be the assignment concentration width of face (width of face to concentration 7-247) which include at least the Takanaka concentration field which be in high concentration 247 (predetermined range) from 127 (middle concentration) , and said threshold decision section 1 change periodically according to the location on the manuscript image of said attention pixel X . An example of the change pattern of said threshold which said threshold decision section 1 supplies is shown in drawing 2 . Two or more arrays of said change pattern 10 are carried out considering the matrix (matrix surrounded with a thick frame in drawing 2) 11 whose threshold which changes by the assignment concentration width of face of 7-247 is 8x8 pixels as a unit. having been shown in drawing 2 -- the part -- it is -- actual -- all on a manuscript image -- said unit matrix 11 is arranged so that the pixel for binary-izing may be included. As said unit matrix 11 is shown in drawing 3 , two kinds of submatrices 11a and 11b are arranged by turns in the direction of a horizontal-scanning line (longitudinal direction of a drawing) and the directions of a vertical-scanning line (the vertical direction of a drawing) of a photo-electric-conversion means, such as CCD. Within each submatrix 11a and 11b, said threshold changes in said direction of a horizontal-scanning line. In said submatrix 11a, the location of the attention pixel X on a manuscript image takes for moving to the right from the left, and the gradation of a threshold increases gradually every 60 with the 7 [minimum] to 67,127,187. On the other hand, in said submatrix 11b, it takes for the location of the attention pixel X on a manuscript image to move to the right from the left, and the gradation of a threshold decreases with the 247 [highest] to 187, 127, and 67 gradually every 60. As a result of arranging two or more said unit matrices 11 which have arranged both the submatrices 11a and 11b by turns in said direction of a horizontal-scanning line, said threshold will change in the shape of a sine wave by the assignment concentration width of face of 7-247 by making 8 pixels into a period according to the location of said direction of a horizontal-scanning line of said attention pixel X. Moreover, as a result of arranging two or more said unit matrices 11 which have arranged both the submatrices 11a and 11b by turns in said direction of a vertical-scanning line, the phase of the change of the shape of a sine wave of said threshold to every 4 pixels becomes reverse in said direction of a vertical-scanning line. A 45-degree screen angle is formed by said unit matrix's 11 corresponding to a screen cel, and arranging both the submatrices 11a and 11b by turns in the example of drawing 2 and drawing 3 in the direction of a horizontal-scanning line, and the direction of a vertical-scanning line.

[0007] Said threshold decision section 1 changes said threshold according to the location of the attention pixel X on a manuscript image based on such a change pattern 10. Said threshold decision section 1 does not need to hold said change pattern 10 altogether, and should just hold said unit matrix 11 and information required in order to generate it. For example, if said every one submatrices 11a and 11b are held, said change pattern 10 can be formed. Said threshold decision section 1 pinpoints the location on the manuscript image of said attention pixel X on the basis of the control signals (the Rhine synchronizing signal, clock signal, etc.) sent out from said control signal sending-out section 103. Said threshold determined based on said change pattern 10 is supplied to said judgment section 106. In said judgment section 106, the binary data from which the multiple-value concentration data of said attention pixel X were changed into the binary data of either of the 2 gradation, and were this changed through the output section 108 are outputted according to said threshold supplied from said threshold decision section 1. The criteria of the judgment in said judgment section 106 are the same as said criteria (A) and (B) except for the part from which said threshold changes. For example, when said threshold to the location on the manuscript image of said attention pixel X is 247, the criteria of the judgment which said judgment section 106 uses are as the following (A') and (B').

(A') Attention pixel value + cumulative error > The binary gradation of an attention pixel is set as black (1) at the time of 247.

(B') The binary gradation of an attention pixel is set as white (0) at the time of attention pixel value + cumulative error <=247.

With [when said criteria (A') and (B') are followed / the value (concentration value of said attention pixel X after modification) which added the cumulative error to the pixel value (concentration data) of said attention pixel X] 247 [or less] Even if it is the case that the concentration of said attention pixel X is larger than a mean value 127, the binary gradation of said attention pixel X will be set as white, and only a pixel with the concentration value of 248 to 255 very near black is set as black at the time of said threshold 247.

[0008] The pixel with the concentration value of 248-255 very near [although based also on the cumulative error accumulated to said attention pixel X] black which was described above is a pixel which should express the object sections, such as a line drawing, fundamentally also in a binary image, and it is satisfactory, even if such concentration is black in monotone in a binary image and it is expressed. That is, it is satisfactory even if the dot which crowded is connected, when it outputs. The case where said attention pixel X is in the Takanaka concentration field smaller than it poses a problem. For example, when expressed by the shade, even if the change is expressed, when error diffusion process which fixed said threshold is performed and a black pixel outputs continuously, the dot of the part is connected, when the pixel which has about 160 to 250 concentration stands in a row, it is black and there is a monotonous possibility that it may be expressed. For example, although the hair of hair changes concentration delicately in a unit according to the hit condition of light etc., the photograph which copied human being's hair will tend to turn into a monotonous black image which only the profile of the hair of hair appears and cannot identify the hair of hair, if error diffusion process which fixed said threshold so greatly as for the concentration difference is performed as the whole hair. On the other hand, if said threshold is changed as above-mentioned, even if about 160 to 250 pixel which ****** stands in a row, a white pixel will generate only the part according to the concentration of the attention pixel X concerned for said every unit matrix fundamentally. Of course, although based also on the concentration of the pixel near the attention pixel X concerned, if the with a concentration of about 230 pixel has solidified, since one bigger threshold than it exists in said assignment concentration width of face roughly, one white pixel will occur [four white pixels] for the 8 pixels of said every directions of a vertical-scanning line for the 8 pixels of said every directions of a horizontal-scanning line. Moreover, if the with a concentration of about 170 pixel has solidified, since two bigger thresholds than it exist in said assignment concentration width of face, four white pixels occur [two white pixels] for the 8 pixels of said every directions of a vertical-scanning line for the 8 pixels of said every directions of a horizontal-scanning line. That is, even when the concentration of the attention pixel X concerned is in the Takanaka concentration field by changing said threshold by said threshold decision section 1, concentration of a dot can soften said every unit matrix 11. The centralized control of the dot by said unit matrix 11 is the same not only when the concentration of the attention pixel X concerned is in the Takanaka concentration field, but even when it is in halftone with the comparatively thin concentration of the attention pixel X concerned. For example, if said threshold is fixed when the attention pixel X concerned is a pixel which has the concentration which is about 30 Although the attention pixel X concerned has high possibility of becoming a white pixel, if said threshold is changed said every unit matrix 11 as above-mentioned Possibility that will be one and four black pixels will be set up for the 8 pixels of said every directions of a vertical-scanning line for the 8 pixels of said every directions of a horizontal-scanning line becomes high. The generating degree of the black pixel within said this unit matrix Since it is controlled by concentration of the attention pixel X concerned, also in the part of said comparatively thin halftone, the power of expression in a binary image can be heightened. Moreover, although the generating error generated in said attention pixel X may increase compared with the case where said threshold is fixed by middle concentration when changing said threshold as above-mentioned A pixel with the concentration value of 248 to 255 very near the black fundamentally mentioned already, and the pixel with the concentration value of 0-7 very near white The almost same definition as the conventional error diffusion process can be secured without not controlling the concentration condition of a dot by said unit matrix 11 unit, and being influenced of the magnitude of said unit matrix 11. Thereby, in the error diffusion-process equipment concerning the gestalt of this operation, and the digital process copying machine possessing this, a tone reproduction high also about a photograph is securable, harnessing the definition of error diffusion-process original about an alphabetic character or a line drawing.

[0009] When the photograph was outputted using the error diffusion process which actually starts the gestalt of this operation, the result just like that was obtained. However, as a result of changing said threshold, it was confirmed that the change carries out and some fault occurs in a line drawing image depending on the direction. Said faults are circumference **** to which those with two and the error diffused from a part for Kurobe affected the white part, and the fault to which the error diffused from the white part affected a part for Kurobe and which carries out extraction injury generating and the fault which the irregularity according to change of said threshold generates in an edge. An alphabetic character image with the method of generating of said two faults in drawing 4 (b) large here is shown. Drawing 4 (a) shows the alphabetic character image which performed the usual error diffusion process which fixed said threshold. Also in drawing 4 (a), although irregularity occurs in a straight line with the edge of an alphabetic character or the problem of a white pixel occurring inside an alphabetic character is seen, there are few the amounts than drawing 4 (b). The sign 41 in drawing 4 R> 4 (b) is circumference ****, a sign 42 is an inside omission, and a sign 43 is the irregularity according to change of said threshold in an edge. It is thought that the former fault originates in the generating error generated in a certain pixel compared with the case where said threshold is fixed having become large as a result of changing said threshold said every unit matrix 11. For this reason, the assignment concentration width-of-face modification section 2 which changes said assignment concentration width of face according to the concentration of the attention pixel X concerned was formed. It seems that a setup of modification of said assignment concentration width of face of said assignment concentration width-of-face modification section 2 is shown in drawing 5 . In the example of drawing 5 , when the concentration of said attention pixel X is in the fixed range (50-200) from middle concentration (127), said assignment concentration width-of-face modification section 2 When said assignment concentration width of face is not changed with a fixed value (247-7=240) but the concentration X of said attention pixel is in the other range (it is smaller than 50 and is the larger range than 200) Monotone reduction of said assignment concentration width of face is carried out so that it may become the assignment concentration width of face which is proportional to a concentration value in the low concentration section, and the assignment concentration width of face which was in inverse proportion to the concentration value in the high concentration section rather than said fixed value. That is, in the case where said attention pixel X has the concentration to which said generating error becomes large, the range of the thresholds 7-247 in said unit matrix is changed into the range of 67-187. By this processing, as shown in drawing 6 , said circumference **** and inside **** were able to be decreased sharply. With an actual output, when distinction is hardly attached but the power of expression in a photograph is taken into consideration, a remarkable thing has the effectiveness of the error diffusion process concerning the gestalt of this operation. Moreover, since said irregularity in an edge originates in change of said threshold in an edge, when the edge extract section 3 which extracts an edge was formed and said edge extract section 3 extracted an edge, it sent out the signal so that said threshold might be fixed by 127 as opposed to said threshold decision section 1. A

general thing can be used about edge extract processing. When the concentration difference of the pixel which has as an example the concentration difference of the pixel which has the attention pixel X up and down, for example in 150 or more and right and left is 150 or more, said edge extract section 3 judges with the attention pixel X concerned being an edge, and said threshold decision section 1 which underwent the output fixes said threshold to 127. Thereby, said irregularity in an edge can also be prevented.

[0010] thus, in the digital process copying machine concerning the gestalt of this operation It distributes to the circumference pixel which is around said attention pixel and has not yet made binary the generating error generated when making an attention pixel binary using a predetermined threshold. On the occasion of performing error diffusion process which repeats the processing which changes the concentration of said circumference pixel about the pixel for values[each / two]-izing on a manuscript image, the Takanaka concentration field located in the predetermined range from middle concentration by the assignment concentration width of face included at least Since said threshold is periodically changed according to the location on said manuscript image of said attention pixel, A high tone reproduction is securable also to photograph drawing etc., a dot stopping being connected easily and harnessing the definition of said error diffusion-process original, when the Takanaka concentration fields, such as photograph drawing, are outputted by the binary image. And since said assignment concentration width of face is changed according to the concentration of said attention pixel, it can stop carrying out [to which the error which the error diffused from a part for Kurobe diffused from circumference **** which affected the white part, and a white part affected a part for Kurobe] extraction injury generating. Furthermore, only when said attention pixel cannot be found in the edge section, said threshold changes, and when said attention pixel is in an edge, since it is fixed, said threshold can suppress that the irregularity according to change of said threshold occurs in an edge. In addition, with the gestalt of said operation, although the 8x8-pixel thing was used for said unit matrix, change of this magnitude and said threshold carries out, a way is not restricted to this, and the more it enlarges magnitude of said unit matrix arranged to per unit distance, the more a more beautiful image expression is obtained. Moreover, it is only about some pixels on a manuscript image to perform error diffusion process concerning the gestalt of this operation. The pixel which serves as a binary-ized object with a certain field judging means may be restricted to some pixels on a manuscript image. Moreover, modification of said assignment concentration width of face by said assignment concentration width-of-face modification section 2 is not restricted to the thing of the gestalt of said operation, either, and you may make it fix said threshold in 50 or less concentration and the 200 or more range. Moreover, although this invention was applied about the digital process copying machine with the gestalt of said operation, it is also possible for it not to be restricted to this and to apply to other image processing systems, such as a printer.

[0011]

[Effect of the Invention] As explained above in the image processing system of a publication, in any 1 term of said claims 1-4 It distributes to the circumference pixel which is around said attention pixel and has not yet made binary the generating error generated when making an attention pixel binary using a predetermined threshold. On the occasion of performing error diffusion process which repeats the processing which changes the concentration of said circumference pixel about the pixel for values[each / two]-izing on a manuscript image, the Takanaka concentration field located in the predetermined range from middle concentration by the assignment concentration width of face included at least Since said threshold is periodically changed according to the location on said manuscript image of said attention pixel, A high tone reproduction is securable also to photograph drawing etc., a dot stopping being connected easily and harnessing the definition of said error diffusion-process original, when the Takanaka concentration fields, such as photograph drawing, are outputted by the binary image. And in said image processing system according to claim 2 or 3, since said assignment concentration width of face is changed according to the concentration of said attention pixel, it can stop carrying out [to which the error which the error diffused from a part for Kurobe diffused from circumference **** which affected the white part, and a white part affected a part for Kurobe] extraction injury generating. Furthermore, in said image processing system according to claim 4, only when said attention pixel cannot be found in the edge section, said threshold changes, and when said attention pixel is in an edge, since it is fixed, said threshold can suppress that the irregularity according to change of said threshold occurs in an edge.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The functional block diagram showing the principal part configuration of the image processing system concerning the gestalt of operation of this invention.
[Drawing 2] Drawing showing an example of the change pattern of a threshold used with said image processing system.
[Drawing 3] Drawing for explaining the unit of said change pattern, and the configuration of the becoming unit matrix.
[Drawing 4] Drawing showing the alphabetic character which circumference ****, an inside omission, etc. generated.
[Drawing 5] Drawing showing the example of modification of the assignment concentration width of face which changes a threshold.
[Drawing 6] Drawing showing circumference **** and the alphabetic character by which the extraction injury dissolution was carried out.
[Drawing 7] Drawing showing an example of the error diffusion ratio in error diffusion process.
[Drawing 8] Drawing showing the outline configuration of conventional error diffusion-process equipment.
[Description of Notations]
1 -- Threshold decision section
2 -- Assignment concentration width-of-face modification section
3 -- Edge extract section

[Translation done.]